AML Report 1804

THE ANIMAL BONES FROM GUSSAGE ALL SAINTS, DORSET.

R.Harcourt. M.Sc,B.V.M.S.,M.R.C.V.S.

INTRODUCTION

All the animal bone was of Iron Age date but of three different phases, Early,Middle and Late. The Early phase yielded the least ~~most~~ bone and the Late the most. The total number of specimens identified was 15,500. ~~This makes is the biggest collection of Iron Age bone yet examined.~~ Notable features are the presence of what is almost certainly domestic cat of earlier date than previously found and the earliest house mouse(Mus musculus) of which both the identification and the stratification are beyond dispute. The most remarkable specimen of all was the complete skeleton of a heifer which had died because of a difficult calving. Thanks to careful excavation and recording it was possible to determine the exact nature of the dystokia, certainly an unusual and perhaps a unique exercise in mammalian palaeo-pathology.

MATERIALS AND METHODS.

All bones and parts of bones were collected during excavation and presented for examination. Only identified specimens were counted and to avoid misleading inflation associated groups of bones such as a limb or a complete skeleton were counted as one bone and for the same reason the very numerous rodent and amphibian specimens were not counted at all.

Rodents were identified by direct comparison with known reference material and by the use of a standard handbook (Corbet 1964).

Measurements were made with sliding or spreading callipers or with an osteometric board and expressed in millimetres. Proximal and distal widths of long bones were measured across articular surfaces only.

No attempt was made to age specimens in years because to do so gives a quite false impression of precision. The preferred approach was to establish age groups and thus a relative and ~~thus~~ not an absolute age structure. Epiphyses fall into three groups, early , intermediate and late fusing. The age at which these events occur in modern stock has been set out by Silver(1969). The early fusing group can be further subdivided into earlier and later fusing moieties. Unfused epiphyses in the two earliest groups must be from young or juvenile animals while a fused one from the late fusing group must originate from a fully adult or aged animal. The only intermediate fusing specimen, the distal metatarsal fuses so late that its fusion time straddles that of the other two groups and is thus best ignored.

The number of unfused epiphyses in the two early groups and of the fused specimens in the late group are then each expressed as a percentage of all the epiphyses. This method can account only for the animals at the bottom and the top of the age scale leaving those in the middle to be derived by subtraction. (~~Group III~~)

The very earliest group(~~Group I~~) consists of the distal humerus,the proximal radius and the distal extremities of the phalanges. The later fusing moiety of the early fusing group (~~Group II~~) consists of the distal metacarpal and the distal tibia. The late fusing group(~~Group IV~~) is made up of the proximal humerus, the distal radius, the proximal and distal femur, the proximal tibia, the olecranon of the ulna and the tuber calcis of the calcaneum.

On the basis of these calculations the animal population is then divided into four groups; the youngest becomes Group I, the next youngest, GroupII, the intermediate, which is derived by subtraction, is Group III and the oldest, those represented by fully fused late fusing epiphyses, are Group IV.

As with the long bones so with the dentition direct ageing in years has been avoided. It is reasonable to assume that the sequence in which the various teeth erupt has remained the same but the actual age at which this occurred in ancient stock is not known. There is considerable variation even in modern animals. To surmount this problem all mandibles at the same stage of development were grouped. ~~and a frequency diagram used~~. The number of stages was deliberately kept low to avoid the risk of over-classification. Because of factors such as individual variability, different planes of nutrition and so forth not all individuals at the same stage of dental development are necessarily the same age. The greater the number of stages the more likely does this discrepancy become.

For sheep and cattle therefore eight stages were used and for the pig, only four. For the relative ageing of horses in this collection by means of the long bones the same method was used as for the other species but for the absolute ageing by means of the lower incisors however the criteria of Miller and Robertson were employed(1952). This is because selective breeding in the horse has been directed towards desired changes in physique and stamina, not to faster growth and therefore there has probably been little change in the ages at which teeth erupt and the speed at which they wear.

For the estimation of the shoulder height of cattle the method of Fock (1966) was used, for sheep that of Tsalkin(1961), for horses that of Kiesewalter(1888)and for the dog that devised by the writer(Harcourt 1974). The meat contribution of each species has been estimated on a comparative basis and not in terms of the actual weight. The sheep was taken as unity and the other species expressed as a ratio of this. The physique of the sheep of the period closely resembled that of the Soay which in peak condition weighs no more than about 65lb(29 kg)(Jewell,pers comm). A similar figure is given by Epstein(1969)for comparable animals.The value for cattle is derived from the known weight of modern animals, based on the writer's personal experience,of a size similar to those from this site and data provided by Epstein(1969) concerning the weight of small breeds of cattle in China. No information concerning the pig is available so an estimate was made from comparative bone sizes. The horses on this site were bigger than the cattle and the value for the ratio is based on this together with weights, again known from personal observations, of modern animals of similar size.Information about the weight of modern red deer was obtained by enquiry and an average figure selected which made allowance for the marked sexual dimorphism in this species. The value for the roe deer was based on the work of Fooks(1958).

DESCRIPTION OF MATERIAL

The range of variation in measurements both within and between the different periods was so small that all measurements have been amalgamated. Other topics such as the age structure, the minimum number of individuals and the meat contribution have been treated separately for each period.

CATTLE- Measurements.

These followed the pattern found on so many Iron Age sites and indicate small lightly built animals with a range of shoulder height from 100-113 cm.(39-44in). The highest value for the coefficient of variation was 5.2 % which points to the cattle being of a single population in terms of size. All measurements are shown in Table I. For the purposes of shoulder height estimation no attempt was made to establish the sex of the animals whence the bones came because the difference between the factors for each sex is so small that the total range in shoulder heights would not have been appreciably altered and there seemed to be no merit in introducing an extra complication. The intermediate value, for the steer, was used in every case(Fock1966)

Table I. Measurements of Cattle Bones

		O.R.	N	M	S.D	C.v.	Ht.
Humerus	dw.	57-72	61	65	3.4	5.2	--
	tl	216-235	7	221	-	-	-
Radius	pw.	54-72	77	70	-	-	-
	tl	233-275	14	251	12.1	4.8	-
M'carpal	tl.	164-185	21	174	6.5	-	100-113*
M'tarsal	tl.	189-206	18	198	5.4	-	103-112**
Phalanx 1	pw.	20-29	83	24	-	-	-
Tibia	dw.	45-54	50	49	-	-	-
	tl.	278-310	3	-	-	-	-
Astragalus	tl.	54-62	54	57	-	-	-
M_3	tl.	29-39	98	34	-	-	-

tl= total length; pw=proximal width;dw=distal width; O.R=observed range of measurements; N=Number of specimens; M=mean; S.D=standard deviation C.v= coefficient of variation; Ht= shoulder height in centimetres
*Multiplication factor:6.12 ** Mf: 5.45

The horn cores found indicated several different shapes and sizes of horn among the cattle but the number of these was no more or less than is usual among horned cattle. One feature of note however was the presence of a skull from a polled animal.This dated from the Middle period, (Feature 459). At the site of each horn core there was a low annular excrescence with a roughened margin and a central pitted concavity which in life would have been filled with soft tissue. There was no connection with the frontal sinus.
The minimum number of individuals (MNI) represented in each period was respectively 28,27, and 56. ~~These figures give percentage values of 28%, 20% and 27%~~ These figures represent values of 28%,20% and 27% of all the"farm" species.
The age structure is shown in Table II, as derived from long bones.

Table II. The Age ~~Structure~~ at Death of the Cattle in Each Period

	Early	Middle	Late
Group 1	6 %	3 %	2
2	5	7	7
3	62	76	75
4	27	14	16

Group1 are young juveniles,Group 2 are slightly older, Group 3 are sub-adult to young adult and Group 4 are the fully mature and the aged animals.
For full description of the calculations see Materials and Methods.

The age pattern derived from mandibles presents a rather different picture. The developmental stages shown by the mandibles have been placed in five groups for each period.

Table III. Age at Death of Cattle as shown by Mandibles

	Early	Middle	Late
All stages up to M_1 in wear	36 %	21 %	12 %
M_2 in wear.	19	3	17
M_3, one cusp in wear.	-	16	2
M_3, 2 or 3 cusps in wear.	36	54	60
M_3, 3 cusps well worn	9	6	9
Total number of mandibles.	11	33	53

M_1= First lower molar; M_2=second lower molar; M_3=third lower molar

SHEEP

The measurements show that these were small slender animals with a shoulder height ranging from 53-64 cm.(21-25 in)

Table IV. Measurements of Sheep Long Bones.

M'carpal	tl.	104-122	33	114	4.6	4.1	53-59*
M'tarsal	".	115-137	29	123	5.5	4.5	54-64 **
Humerus	dw.	21-29	78	24	1.3	5.6	-
	tl.	109-114	3	-	-	-	-
Radius	tl.	126-149	12	137	-	-	-
Tibia	tl.	177-210	7	190	-	-	-
Femur	tl.	154-155	2	-	-	-	-

Abbreviation code as in Table I.

* Multiplication factor :4.86 ** MF:4.68 (Tsalkin 1961)

Throughout the archaeological record sheep appear to have changed but little in size although there is evidence of larger animals in the Roman period. Those from Gussage however seem to have been unusually small and slender. A comparison was made between the metacarpals and metatarsals of ~~all~~ the sheep of all periods that have been examined and recorded by the writer and those from thid site. The parameters compared were the total length and the mid-shaft diameter index; the diameter expressed as a percentage of the toal length. The results are shown in Table V.

Table V. Comparison of Gussage metapodials with those from other sites.

	Total	108-116mm	>116 mm	msdI >10	Total	118-126 mm	>126 mm	msdI >8
Gussage	33	67%	26%	6%	29	72%	21%	41%
All sites	140	27	70	58	104	36	62	68
	Metacarpals				Metatarsals			

msdI = mid-shaft diameter index

From these figure it can be seen that this site has yielded a high proportion of short slender bones.

Some of the skulls had heavy horn cores, on others they were lighter suggesting that both ewes and rams bore horns but no polled skulls were found. Many horn cores were present which had been carefully cut or sawn, in some cases both, to detach them from the skull.

The age structure is shown in Table VI as derived from long bones.

Table VI. The Age at Death of the Sheep in each Period.

	Early	Middle	Late
Group 1	5 %	5 %	5 %
2	19	26	16
3	64	55	67
4	12	14	12

See Table II for the Group definitions

Table VII. Age of Death of Sheep as shown by mandibles.

	Early	Middle	Late
All stages up to M_1 in wear.	52 %	31 %	28 %
M_2 in wear	14	8	21
M_3, one cusp in wear.	3	5	5
M_3 , 2 or 3 cusps in wear.	30	47	42
[illegible]	[illegible]	[illegible]	[illegible]
M_3, 3cusps well worn.	1	9	4
Total number of mandibles	88	114	192

Abbreviations as in Table III

The minimum number of individuals represented in each period was respectively 46 (46%), 79 (60%), and 112 (54%).

PIG.

As is so frequently the case with this species the number of bones sufficiently complete to yield measurements was noticeably less than that from other species. The coefficient of variation for one specimen, the distal humerus , ~~was~~ is rather ~~high~~ high but this result is most likely brought about by the presence of two humeri of 40 mm distal width, probably from large adult boars, together with the fact that the smallest ones may be from immature animals. In spite of this high variability therefore, there is little doubt that only domesticated animals are represented.

Table VIII. Measurements of Pig Long Bones

	O.R.	N.	M.	S.D	C.v
Humerus dw.	25-40	18	31	4.3	13.7
Astragalus tl.	35-42	17	38	2.1	5.5
M_3 tl.	30-35	18	33	-	-

M_3= lower third molar

The complete absence of entire long bones precludes any attempt to gauge the shoulder height of the pigs but the dimensions quoted can be ~~xepeatedx~~ matched by identical ones from any era suggesting that the pig did not change very much in height or physique over a very long time.

Table IX. The Age at Death of the Pigs in each Period

	Early	Middle	Late
Group 1+2	34 %	45 %	35 %
3	62	53	62
4	4	2	3

See Table II for the Group definitions

For the determination of the age structure of the pig from the mandibles only three groups were used as will be seen in Table X.

Table X. Age at Death of the Pigs as shown by the Mandibles.

All stages up to M_1 in wear.	26 %	13%	33 %
M_2 in wear.	41	40	32
M_3 in wear.	33	47	35
Total mandibles	27	15*	37

*Sample size probably too small for results to be valid.

The minimum number of individuals represented was 13 (13%), 18 (14%) and 17 (8%).

GOAT

This species was represented in all periods but much the most common evidence of its presence was horn cores many if not most of which had been cut or sawn at the base to detach them from the skull. The total number of specimens however was no more than 25. The minimum number of individuals was tentatively estimated at 4, ?2 and ? 3 respectively.

Table XI. Measurements of Goat Bones

	tl	pw	msd	dw	msdI	
Humerus	135	-	14	27	-	
Radius	159	27	15	22	-	
Femur	167	-	13	-	-	
Tibia	201	35	13	20	-	
M'carpal	101	21	13	24	12.9	%
	105	21	14.4	25	13.3	%
M'tarsal	106	15	11	21	10.4	%
	108	16	12	22	11.1	
	109	17	11	22	10.1	

Tl=total length; pw=proximal width; msd=mid-shaft diameter; dw=distal width; msdI=msd.100/tl(ie.msd index)

HORSE

The remains of this species were numerous and of particular note is the high proportion of entire long bones, a total of 66 was present not including the first phalanges. The minimum number of individuals represented was 9(9%),7(5%), and 17(8%) .

The measurements show that most of the animals fit into the usual Iron Age size range, that is from about 110-135 cm. The smallest and largest however extend this in each direction so that it becomes 102-145 cm, that is 10-14 hands. The lower end of the range is provided by a tibia, the smallest yet recorded from the period, of only 236 mm. This indicates an animal with a shoulder height of 102mm(10 hands). Another specimen, a humerus of distal width of 56mm must have come from a horse of similar size. Both these two bones were small enough to arouse the suspicion that they may have come from a donkey, the bones of which can be difficult to distinguish fom those of a horse.

The cheek teeth and the third phalanx of the donkey however are fairly characteristic ~~and~~ but while these specimens were both well represented, all unquestionably originated from horses. It was concluded, in the absence of such supporting evidence, that the tibia and humerus referred to were those of a very small horse, as small as a modern Shetland pony.

Table XII. Measurements of Horse Bones

		O.R	N	M	S.D.	C.v	Ht.
Radius	tl	285-334	22	304	12.6	4.2	123-145 cm
M'carpal	tl	183-223	18	199	9.3	4.7	117-143
M'tarsal	tl	225-271	14	256	19.8	7.7	120-144
Tibia	tl	236-296	12	280	17.5	6.3	102-129
1st Phalanx	tl	63-86	23	72	5.3	7.3	-
Humerus	dw	56-76	34	62	-	-	-

The age structure of the horse population showed a feature which set it apart from that of all the other species, the cattle, sheep and pigs. The bones from all these included not only many from young animals but also from the newborn and from foetuses. Such specimens were totally and conspicuously absent from the horse material. The possible, indeed probable, meaning of this finding is discussed later.

Table XIII. The Age at Death of the Horses in each Period

	Early	Middle	Late
Group 1&2.	0 %	0 %	0 %
3..	0-39*	31	43
4.	61-100*	69	57

* Early fusing fused bones were present and these could have belonged either to the intermediate or the late age group; there were no unfused late fusing bones from this period.

From all periods combined there was a total of 41 mandibles with the incisors, or enough of them, still present so that it was possible to age the animals direct.

Table XIV. Age at Death of the Horse as shown by the Mandibles.

	O.R	N.	M.
Early	3-18 yo	8	8 yo
Middle	3-17	8	9
Late	4-17	25	8

DOG

The whole collection included the remains of some thirty animals. Several entire skeletons were present and, generally, the number of complete long bones contributed by this species was higher than from others, as is very often the case. The skulls and long bones totalled 160 and the mandibles 57.

The size and physique of the dogs on this site were typical of those from the Iron Age as a whole (Harcourt 1974). They ranged in shoulder height from 36-58 cm. The bones of very young puppies, some probably new-born, were quite numerous. This may have reflected a policy of deliberate control of numbers or simple neonatal mortality.

Table XV. Measurements of Dog Bones

	O.R	N	M	S.D	C.v	Ht.
Humerus	120-176	39	150	14.7	9.8	35-58 cm
Radius	116-176	37	153	14.8	9.7	39-58
Ulna	152-201	8	178	-	-	43-56
Femur	120-190	32	168	15.7	9.4	36-58
Tibia	130-194	37	176	19.2	10.9	39-57
Skull I	145-200	7	-	-	-	-
Mandible tl.	56-81	57	66	-	-	-
M_1 tl.	16.4-25.6	72	22	-		-

Abbreviations as in Table I. Skull I = length of skull from occipital protuberance to anterior margin of alveoli between central incisors. Mandible tl= length from condyle to anterior margins of incisors. M_1= lower first molar

---

Several bones bore cut marks. They were most marked in a radius round the distal extremity of which there were several, all at right angles to the long axis of the bone.

CAT

Five features yielded remains of this species; 1,424, Middle period, 77, 157 and 381, all Late. There is always difficulty in distinguishing wild from domestic cats and the ususal criterion, rightly or wrongly, is size. In addition to this problem is the fact that the introduction of the domestic cat is conventionally attributed to the Romans. Before claiming that the arrival of a particular species was earlier than previously thought the evidence on which such a claim is based should be strong.

All the material from the cat with the exception of one specimen was from immature animals and from one feature there came not less than five new-born kittens. Because of the immaturity of the animals represented the size of the bones is no help in coming to a decision but the very fact that all the specimens, with the one exception referred to, were from such young animals makes it highly probable, it is suggested, that only domesticated animals are represented.

Even if, as could be claimed, the kittens were the litter of a wild cat there would seem to be little point in bringing them back to the settlement.

and indeed not much point in killing them at all. It is hard to imagine also why Iron Age people should have wished or needed to kill wild cats except for their fur and for this purpose adults are clearly the most useful.

The evidence therefore that these cats were domestic is based on inference and cannot be said to be conclusive but it is felt that the balance of probability favours the suggested conclusion.

WILD SPECIES

Table XVI. Showing periods in which Various species found. **

	Red Deer	Roe	Hare	Badger	Marten	Polecat	Fox
Early	+	+	+	-	-	+	-
Middle	+	+	-	+	-	-	+
Late	+	+	+	+	+	-	+

** Rodents are described separately

RED DEER
~~XXXXXXXX~~ (Cervus elaphus)

The remains of this species were found in 79 features and the dimensions of the measurable bones are shown in Table XVII. The question of the relative numbers of the different bones of the body that were present is discussed under "The contribution of Hunting to the Economy".

Table XVII. Measurements of Red Deer Bones.

	tl.	pw.	msd.	dw.
Humerus	-	-	-	46-47(2)
Radius	295	53	35	44
		46-47(2)	-	51
M'carpal	262	23	37	41
	265	36	22	38
	268	38	24	43
	290	46	27	49
	-	37-42(2)	-	40-44(3)
Tibia	-	-	-	42-43(3)
Astragalus	47	-	-	-
M'tarsal	291	33	23	41
	292	34	24	-
	307	37	28	45
		32-39(3)	-	40-45(3)

Abbreviations as in Table XI.

ROE DEER (Capreolus capreolus)

Roe deer were represented in 27 features and the most common specimen was the mandible which constituted 44%.of the total for the species. The only measurable bones were a complete metacarpal of dimensions : 159,tl:20,pw: 12,msd:21,dw. and a distal humerus of 25 mm.

HARE (Lepus capensis [europaeus])

The hare was present in six features, being represented by one specimen from the Early period and by five from the Late.

BADGER (Meles meles)

Six features yielded remains.

MARTEN (Martes martes)

This species was found only in the Late period,in feature 329/5 and the specimen was a very well preserved skull. Its maximum length was 89.5mm, the post -orbital constriction was 19.1 mm, the palatal length 42.1mm, the palatal breadth 25mm, the rostral width, 18.9mm and the maxillary cheek tooth row 25.2 mm.

POLECAT (Mustela putorius)

The remains of this species comprised a humerus, radius, femur and an innominate bone.all from one feature and probably from one animal.

FOX (Vulpes vulpes)

The fox was represented in nine features .

RODENTS, INSECTIVORES AND AMPHIBIANS

These were present in 88 layers from 61 features. The species were the common shrew(Sorex araneus),the wood-mouse(Apodemus sylvaticus), the bank vole,(Clethrionomys glareolus), the water-vole(Arvicola terrestris) the field-vole(Microtus agrestis) and the house mouse(Mus musculus).

Among these the only species of note is the house mouse. This was found in two features; a part of the skull with teeth and one ramus of a mandible without teeth from the Middle period(Feature584/13) and from the Late period,(Feature123/12)the frontal region of a skull with all the teeth present . Both these features were sealed and the possibility of intrusion is completely ruled out. This would seem to be the earliest record of the house mouse in Britain of which both the identification and the stratification are beyond dispute.(Corbet, pers.comm)

The bones of amphibians, either frog or toad,were numerous but not otherwise noteworthy.

FISH

The remains of fish were found in the Early period only.(Feature 116/6) They are those of the dace(*Leuciscus leuciscus*) and a minimum of two fish are represented, both about 23 cm(9in) in length.

BIRDS.

Birds were well represented in all periods and the species present in each is shown in Table XVIII.

Table XVIII. List of Bird Species in each Period.

Species	Early	Middle	Late	Undated
Domestic Birds.				
Goose(*Anser sp.*)	+	-	-	-
Duck(*Anas sp*)	-	+	+	-
Fowl (*Gallus sp.*)	-	+	+	-
Wild Birds - ? Food				
Heron (*Ardea cinerea*)	-	-	-	+
Mallard (*Anas platyrhynchos*)	+	+	-	-
Wigeon (*Anas penelope*)	-	+	-	-
Common Scoter (*Melanitta nigra*)	-	+	-	-
Crane (*Grus grus*)	-	+	+	-
Kittiwake (*Rissa dactyla*)	-	-	-	+
Wood pigeon (*Columba palumbus*)	-	-	+	-
Hedge sparrow (*Prunella modularis*)	-	+	-	-
? Goldfinch (*Carduelis carduelis*)	-	+	-	-
Jay (*Garrulus glandarius*)	+	-	-	-
Jackdaw (*Corvus monedula*)	-	-	+	-
Rook/crow (*Corvus sp.*)	-	+	+	+
Predators/ Scavengers				
Common buzzard (*Buteo buteo*)	+	+	+	-
Hen harrier (*Circus cyaneus*)	-	-	+	-
Raven(*Corvus corax*)	-	+	+	-

These identifications suggest that the keeping of domestic poultry figured fairly prominently in the economy of the settlement. The domestic fowl first appeared in the Iron Age but did not become widespread till Roman times.

The list of other species indicates that wildfowling may have provided a useful contribution to the food supply and at least three hunting areas are suggested by the list; marsh and freshwater as evidenced by heron, crane and ducks; woodland providing pigeon, jay, crows and possibly raven, and finally open bushy country as a source of the hedge sparrow and finch.

It is possible that the buzzard and hen harrier were killed because they were raiding poultry. The raven is a scavenger but might have attacked poulry chicks.

The record of the hen harrier, as far as it has been possible to ascertain, is the first from the prehistoric period in Britain.

SPECIES MEAT CONTRIBUTIONS

The ratios used for calculating the contribution of each species (see Materials and Methods) are as follows: ~~Cattle:Horse:Pig:Sheep/and Goat:~~

Cattle: Horse: Pig :Sheep/Goat: Red deer : Roe deer

10 12 1.5 each 1 5 1 .

The ratio for a particular species is multiplied by the minimum number of individuals for each period to give the number of "meat units"(mu) contributed by that species. This value is then expressed as a percentage of the total meat units provided by all species combined (MU). Then the percentage meat contribution = $\frac{mu}{MU}$.100.

There is reason to believe that the dog may have been used as a food animal in the prehistoric period (Harcourt 1974) but it, the small wild mammals and the birds have all been excluded from the calculation which is intended to compare only the relative contributions of the major domestic species, ~~and of the sheep~~ of the deer and the horse.

Table XIX. Species Meat Contributions .

Early	Cattle	Sheep	Pig	Horse	Goat	Red deer	Roe deer
MNI	28	46	13	9	4	1	1
% MC	61	10	4	23	<1	1	<1
Middle							
MNI	27	79	18	7	?2	3	4
%MC	57	16	6	17	<1	3	<1
Late							
MNI	56	112	22	17	?3	4	3
%MC	60	12	3	22	<1	2	<1

MNI= Minimum number of individuals. %MC= %Meat contribution.
<1= less than 1

The bone debris found sealed in features such as pits and ditches is more likely to be a true reflection of what was originally present than is the debris from open floors ~~and~~ or even middens. These, no matter how squalid the physical conditions of a settlement, must have been cleaned out from time to time so that the bones would give only a terminal picture. For this reason it is probably a mistake to endeavour to derive the actual weight of meat represented at any particular site except that of a single kill or single killing site such as that described by Wheat (1967) in which the remains of some 200 bison which had been stampeded into a gully were found. The ratio method, although not without fault, is probably the best available.

There is no way of knowing how large a part meat formed of the diet of prehistoric man. Thus any argument based on assumptions that a certain weight of meat was eaten per day or per week would almost certainly be circular. There is plenty of evidence from ethnography that pastoral people, at any rate, do not eat much meat (Cranstone 1969). The writer holds firmly to the opinion that this could well have been true in prehistoric times and there is certainly no evidence to justify assuming the opposite.

Meat, it must be remembered, is a terminal product, whereas a subsistence economy demands a sustained yield.

THE CONTRIBUTION OF HUNTING TO THE ECONOMY

It is possible that hunted animals may be under-represented on this and similar sites. When an animal is killed some distance from the settlement the transport of the entire carcase involves considerable labour. This can be avoided by skinning the body, leaving the lower limb bones ~~still~~ on the skin to act as handles and removing the meat from the bones which are then discarded on the spot. To test this hypothesis an analysis was made of the relative numbers of the various bones of the body for both red and roe deer.

These were classified as either meat or waste bones. The waste bones are defined as those removed with the skin, namely the head, lower limb bones and the feet. The meat bones are all the rest.

Each of these categories was expressed as a percentage of all bones for each species. The results for the red deer were that the meat bones comprised 19% and the waste bones, 81%. For the roe deer the values were very similar, respectively 22% and 78%. Even after due allowance is made for the fact that many of the waste bones survive better than do the meat bones these values lend support to the above suggestion.

It is evident from the number of red deer bones and antlers found that these deer were still common and widespread well into the Roman period if not later and it would be surprising if they had not been exploited. It seems probable therefore that the true contribution of hunting was greater than that suggested from the values shown in TableXIX. and that generally speaking, there was more hunting in the Iron Age ~~have been~~ than the small number of deer bones found on sites of the period indicate at first glance.

ECONOMIC INTERPRETATIONS

Many bone collections are not truly representative of the stock keeping practices of the site whence they originate. This is so of ritual, town or village and monastic sites at which there would have been some pre-selection before meat products, on or off the bone, came on to the site. All the evidence suggests that Gussage is a true subsistence site and that the bones mirror what actually happened in the animal population from birth to death. All parts of the body of all the domestic farm species are more or less equally represented and all the age groups from the foetal and newborn right through to those of advanced age are present in proportions suggesting a dynamic "natural " population.

It is almost certainly a mistake to assume that all bones are necessarily those of deliberately killed animals and good evidence of the falsity of such a belief is supplied by the skeleton of the heifer that died because of a difficult calving.

~~The presence of the remains of cattle, sheep and horses of advanced age demonstrates.~~

The interpretation of the true age structure is complicated by the fact that for cattle, sheep and pigs the epiphyses show one picture and the mandibles another for the different age groups. The mandibles indicate a markedly higher proportion of old animals. This maybe because of differential survival, the mandibles of old animals are thicker and heavier than those of the young.

The mortality among the youngest age group of cattle as shown by the long bones and even more so by the mandibles(Tables II, III) seems to have been higher in the Early than in the Middle or Late periods. It is known that Roman cattle were slow maturing (White 1970) and there is no reason to suppose that those of the Iron Age differed in this respect so that to kill young calves would have been a thoroughly bad practice. There can be little doubt therefore that the mortality in the youngest groups reflects natural deaths.

For all periods the general pattern of peak mortality, although differing slightly in degree, was similar and occurred in Group 3(Table II) and in the M_3, 2 or 3 cusps in wear category(Table III). A tentative estimate for the range of these groups is from 4-6 years.

Slow growing cattle take from 4-5 years to reach their maximum weight so that this group may include steers not required for draught purposes and killed at this time for meat. It is quite likely cows did not produce their first calves till three or even four years of age (White 1970) so the only females included would have been those culled for one reason or another; because of infertility, poor milking performance and hence inability to raise a calf or because of mastitis.

Cattle become suitable for draught purposes from about three years old but some animals prove to be untrainable and any falling into this category would perhaps have been fattened and slaughtered.

The metacarpals were plotted on a scatter diagram (Fig I) by the method of Higham and Message(1969) but no clear-cut groupings emerged nor was any evidence recognised that might have been interpreted as indicating selective slaughter either by age or by sex.

When the distal widths were plotted against total lengths however(FigII) the pattern suggested that castration was practiced. In general the metacarpals of bulls and cows are about the same length but those of bulls are thicker whereas those of steers are longer than either but of similar thickness to those of cows. (Clason 1967).

The age pattern of the sheep derived from long bones is very similar to that of the cattle with peak mortality in all periods in Group 3.(Table VI) There is a similar disparity between the picture presented by the bones and that shown by the teeth; in the Early period there are no less than 52% of all mandibles in the first development stage group,(Table VII) that is up to and including M_1 in wear. This stage is less well represented in the other two periods but the proportion is still very high, 31% and 28%. No regime of sheep husbandry known to the writer provides a reasonable explanation for such a pattern . The sheep being of the size that they were the lambs at such a stage of dental development would have been still so small that to kill them for meat would seem almost incredible but failing any other explanation this is perhaps what happened.It is hard to credit natural mortality alone as the cause. The group 1 mortality of 5% must reflect natural deaths in the very young, a particularly vulnerable ~~per~~ time in sheep. Group 2 figures of 16-26% are too high to be so explained and may well indicate a selective kill of the best grown male lambs not required for flock replacement. By this age in a good year they could be an adequate size even in a small breed. The proportion of sheep in which the lower third molar was erupted ranged from 34% - 61%.This is a late ~~expxxing~~ erupting tooth which,if the figure for semi-wild hill sheep quoted by Silver(1969) is accepted for the Iron Age, erupted at 3-4 years. In all three periods those lower third molars which had two or three cusps in wear or three cusps well worn were by far the most numerous suggesting that the upper end of the age range was in fact rather higher. An age pattern such as this is to be expected if the sheep were kept mainly for wool or milk with meat as a secondary product.

For the pig ~~again~~ there was again a discrepancy between the age pattern as derived from long bones and mandibles but less so than in the other two species. According to the mandibles all age groups were about equally represented but the long bones show that Group 4, the oldest, in no period contributed more than 4%. The pig is of use only as a provider of meat and because of its prolificacy is the source of a high sustained yield, higher than that produced by any other species. For the same number of younger animals fewer breeding females are required.

Even with modern living horses accurate ageing is very difficult because of individual variation. With material such as is available from this site clearly no claims can be made for the precision of the estimated ages but because it is the age structure of the population not of the individual that is important this fact does not matter. It is likely that estimates that are too high will be compensated by those that are too low.

The evidence provided by Tables XIII and XIV is unanimous; only adults and mature adults are represented. There is only one interpretation, it is suggested, that fits such a picture and that is that no breeding of horses was practiced; they were rounded up periodically and selected animals caught and trained. Some would have died of disease, some of injuries, some would no doubt have been killed for one reason or another and these would probably have been eaten.

An identical picture was found at the Iron Age site of Longbridge Deverill in Wiltshire, the bones from which were examined by the writer.

A horse is not suitable even for light work until at least three years of age thus, if the round -up technique were used, the disadvantages in terms of care, attention and non-productivity during this long period of time would be avoided. Furthermore the weaker animals would be weeded out by the usual biological processes of disease, starvation and the activities of predators so that the horsemasters of the time would, even if unconsciously, reap the benefits of natural selection.

In the light of the evidence from these two major Iron Age sites ~~therefore~~ it is proposed that the practice described, of the periodical round-up, capture and training of mature horses was widespread if not general, at least in Wessex. It is a moot point therefore, if this suggestion is correct, whether the Iron Age horse should be regarded as domestic, feral or wild.

ANATOMICAL ANOMALIES AND PATHOLOGICAL ALTERATIONS

Dental anomalies were a feature of the material from this site especially in the cattle remains. There were 16 mandibles with only five cheek teeth, a quite common finding in prehistoric and early cattle in the writer's experience. In most of these the first premolar was absent. In ten mandibles the third cusp of the lower third molar was either reduced or absent. The same change was noted in the mandible of one sheep. Two bovine mandibles were present in which the third lower molar was well in wear on one or two cusps beford the third premolar had erupted at all.

Among the cattle remains only two bones showing pathological lesions were found. These were a metatarsus the proximal extremity of which showed the changes of early osteoarthrosis with slight eburnation and "lipping", a condition often incorrectly referred to as "osteoarthritis" and a calcaneum which had sustained a fracture.This was on the lateral aspect and had not united. There was very little callus formation and the fractured surfaces were rough and pitted.Its appearance suggested the fracture had become infected.

The foot of a sheep showed syndactyly in that the two third phalanges were firmly fused together; one was of abnormal shape. There was a ~~xx~~ mandible exhibiting periodontal disease, a condition in which there is a swelling of the jaw bone and a loosening of the teeth. The cause is not known for certain but it is more likely, according to the available evidence,that it is associated with nutritional imbalance or deficiency than with infectious disease.

One pig mandible from the Early and one from the Middle period each had an abscess cavity. In the first the cavity was 8 by 11 mm, between the fourth premolar and the first molar and there was ~~xxx~~ a swelling extending a short way beyond it on either side. In the other and more severe case the abscess extended from the first to the third molar and the cavity was 43 by 20 mm. This must have been a very painful lesion ~~xx~~ which would seriously have interfered with feeding and may, for that reason, have been the ultimate if indirect cause of death. Another pig specimen was a tibia in which there was an oblique healed fracture of the distal end of the shaft.

The most common lesion in the horse material was osteoarthrosis of the proximal metatarsus which was seen in five specimens.This ~~is quit~~ condition is fairly common in modern horses but its high frequency on this site may be explicable by the fact that Iron Age horses were used for draught purposes. Such a use and the strains that follow from it are thought to be associated with this lesion and it is ~~also~~ seen quite often in cattle metatarsi. Osteoarthrosis was also found on a first phalanx. The distal articular surface was affected there being exostoses above and around it and extending on to the shaft .

Osteoarthrosis was ~~also~~ seen on both shoulder joints of a dog from ~~Xxxxxxx~~

Feature 229 (Late). There was a rim of exostosis of "beaded" appearance round the head of the humerus and a similar but flattened rim round the glenoid cavity. Both humerus and scapula showed eburnation of the bone surface.

A radius was markedly distorted, the distal extremity being bent outwards although it was still in the correct latero-medial plane.

There were eight fractures, one of the humerus, two of the radius and ulna, one of a metacarpal and four of the tibia. The metacarpus had healed in perfect alignment as is to be expected because of the natural splinting effect provided by the adjacent bones. In all other cases there was some distortion. The humerus exhibited a diagonal distal shaft fracture which was firmly united and the callus smooth suggesting it must have occurred not less than one year previously. The distal fragment had been displaced upwards and sideways.

One radio-ulnar fracture had united satisfactorily, the other had not. In the first the break had occurred in the proximal third and had healed with marked antero-posterior bending and outward rotation of the upper half of the radius and inward rotation of the ulna. The callus was smooth and symmetrical. In the other radius complications had set in; there was no union. In the same layer of the same feature there was also a tibia and fibula, both fractured. From the sizes of these three bones and the fact that they were from the same layer it is thought highly likely that they came from the same animal. The two latter bones were also unhealed and showed a bony proliferation and swelling. There are two possibilities: either both injuries were incurred at the same time to be followed by infection of the bone marrow, osteomyelitis, or one alone which was followed by osteomyelitis which then spread via the bloodstream to another bone so weakening it that it broke, a so-called pathological fracture.

There were two mid-shaft fractures of the tibia; one had healed completely but the distal portion had become bent forwards and outwards . In the other union had started but was not complete. The callus was rough and there was a gully between the opposing edges. A diagonal fracture of the crest in another tibia presented an identical appearance suggesting that the two injuries had occurred several months earlier.

The most remarkable pathological specimen of all was the almost complete skeleton of a cow which had died because of a difficult calving. (Pl.I-II Fig.III.)This was found in Feature 61 (Late). The bones of the fore-legs of the calf can clearly be seen protruding beyond the maternal pelvis and just visible are several other unidentifiable bones in front of the left femur of the dam.Further excavation showed that these were the skull and hind limbs. Their positions are demonstrated in the drawing.(Fig). From this it can be seen that the head of the calf is turned back towards its flank.

This particular malpresentation can be very difficult and sometimes impossible to correct. In the latter event embryotomy or caesarean section is necessary. The reasons for this in the case of a trained person are two; firstly if the dam is small there may not be room to insert a hand and arm to carry out the necessary manipulation and secondly the head of the calf may be so far back that it is physically impossible to reach it. If untrained individuals are involved they may either do nothing through ignorance or merely pull on the fore-legs without making any attempt to reposition the calf, a course of action which ~~xx dxxxxx xx fxxx~~ achieves nothing except to exhaust both operator and the cow. ~~W~~ In such a situation slaughter is the only possible solution. ~~xxxxxxxxxxxx fxxxxx~~

BUTCHERY

There was no evidence of butchery in the sense of cutting up carcases into small pieces. Saw marks were found only on horn cores and antlers, not on bones. Several dog bones bore cut marks suggesting that the carcases had been defleshed and there were a few limbs~~xxxxx~~, the components of which were in the correct anatomical relationship. This indicates that the meat had been cut from them and the limb then thrown into a pit still held together by tendons.

A bovine skull was found in Feature 379 which had a circular depression in the mid-line a short distance below the intercornuate ridge. The disc of bone measured 39 by 34 mm; it and a surrounding zone, 10 mm in width, showed a brownish discolouration. (~~Fig.~~ Pl III). This injury looks as if it was caused by a rounded blunt instument, undoubtedly ~~fxxxx~~ performing the function but not necessarily having the shape of a pole-axe.

DISCUSSION

Minimum numbers of individuals were estimated by counting the most frequently occurring skeletal specimen. More elaborate methods have been outlined ~~by~~ (Chaplin 1971) but these entail much extra labour without commensurate extra information. By their use it can be shown that there is evidence for more individuals of each species than by the simple method but the ratio of any one species to the others is not necessarily altered so that the overall picture remains the same.

The ageing method used for this collection demanded that the unfused epiphyses in the early fusing group and the fused epiphyses in the late fusing one be expressed as a percentage of all the epiphyses. ~~xx~~ This is in distinction to the method described for Durrington Walls (Harcourt 1971) and by Chaplin (1971) whereby each of these categories is expressed as ~~x~~ a percentage of its own group, not of the total. ~~It is clear that~~ This latter method is in error and cannot be used to derive the age structure of a whole population because it refers to differences within groups ~~and~~ rather than ~~not~~ to those between ~~groups~~ them. By this modified technique the proportion of fully mature cattle represented at Durrington Walls(Harcourt 1971) is reduced from 75% to 33% and the number of sheep of the same age group at the Treaury site(Chaplin 1971) from 68% to 12%. It will be noted how much more closely these figures match those at Gussage(Tables II and VI) than do the originals. They represent, in the writer's opinion, a far more realistic picture of the probable stock keeping practice and mortality pattern at the two sites.

The difficulties and uncertainties of the ageing of prehistoric farm stock from their bones and mandibles is neatly shown by the cow which died of a difficult calving. The age in years represented by the stage of fusion of each long bone according to Silver(1969) has been put in brackets after it. The following bones were fused; right metacarpal(>2.5y),proximal first phalanges(>1.5y), distal tibia(>2.5y),and the distal humerus(>1.5y). The following were unfused; left metacarpal(< 2.5y),the metatarsals(<3y), the proximal humerus,distal radius,proximal and distal femur, proximal tibia and the calcaneum(all<3.5y). The conclusion to be drawn from the foregoing is that the animal was a little less than three years of age. However the third lower molar had emerged from the alveolus although it probably would not have been visible through the gum, suggesting a possible age of four years. If a compromise is accepted between the age suggested by the bones and that by the teeth then the animal would have been 3-4 years old at death.

While it is tempting to assume that this calf was the dam's first there is no evidence that would either support or refute this belief. If it was her first this fact would at least be consistent with the practice followed by Varro,in Roman times, whose "heifers were not allowed to conceive before they were two years old and it will be all the better if they are four years old before they are allowed to bear a calf." (White 1970 p.286)

Polled skulls have been found at only four other sites in Wessex ; All Cannings Cross(Cunnington 1924),Swallowcliffe Down(Jackson 1925), Longbridge Deverill(Hawkes,unpubl.) and Mount Pleasant(Wainwright,in prep). In Southern Britain this trait has not been found outside Wessex or before the Iron Age and it exists at the present day nowhere else in Europe except Scandinavia. It arose among horned cattle as a mutation and it is most unlikely that such a mutation would occur more than once in such a restricted area as Wessex during a time as short as the span of the Iron Age.For these reasons there is a high probability that the mutation occurred in Britain among the cattle of Iron Age immigrants. The gene for the character is dominant and the offspring of polled cattle would therefore exhibit the feature.It is suggested that the finding of the skulls of polled cattle over a wide area of Wiltshire and Dorset- and there must be many more as yet undiscovered- is strong evidence for the exchange of cattle among Iron Age people. Such exchange may have been legitimate by means of cattle markets or have occurred by stock theft, an ~~xxxxxxxx~~ activity that has long been highly regarded by the young men of cattle owning tribes.

In modern agricultural practice the production of meat is of prime importance but, as has already been remarked, the amount of meat eaten by prehistoric man may well not have been great, certainly not so great as is so readily assumed with very little supporting evidence. If this suggestion is correct then meat would have come low on the list of primary products although, no doubt, very welcome when it became available. Economic interpretations of bone collections from the prehistoric period are largely coloured by if not based on the assumption that the reasons for keeping stock and the management techniques used were respectively rational and efficient by twentieth century Western European standards. Such an assumption may well be wrong. Tacitus(cited by Piggott 1965) says of the Germani that " their cattle were poor but it was number that was chiefly valued; they are the most highly prized, indeed the only riches of the people." They have been similarly regarded for a long time in parts of Africa where they constitute visible wealth and hence prestige, a walking bank balance but one drawn on only for very special occasions such as ritual of one sort or another or for the payment of bride price.

Different species may be exploited in the same or different ways, one being slaughtered and eaten at the end of a lifetime of production or service, another not. At one time both horses and cattle were used for draught purposes in Britain but only cattle were killed and eaten. Such a distinction is quite irrational and probably based on religious prohibitions. In this report it has been assumed that the horse was a food animal but it is noteworthy that the number of complete long bones from all periods yielded by cattle was 63 and by horses, 66, but the number of cattle(111) was more than three times as great as that of the horses(33). This discrepancy could mean that horses were not eaten, or were eaten but that the carcases were prepared differently or it could be due to chance. The last explanation is probably the least likely.

Whatever the reasons for which stock were kept and no matter how strange they may seem in a modern context there are no grounds for assuming that the stockmen of the time were not both skilful and knowledgeable, even if only empirically. Numerous individuals of all species survived many winters. It is highly probable that the stock of the time possessed a natural hardiness and ability to thrive when conditions were poor that is largely lost to most breeds of modern farm animals. Invaluable as such an attribute would obviously be it would still need to be supplemented by good stockmanship. It has been said that "ancient domestication might be defined as a combination of malnutrition and overcrowding". (Perkins and Daly 1968). Such sweeping and unsupported assertions about prehistoric animal husbandry are quite unjustified. The evidence simply does not exist either for this or for the endlessly perpetuated myth of so-called " autumn killing". Cattle and sheep that were getting old or were unsuitable for some other reason may well have been fattened and ~~slaughtered~~ killed but that is a very different proposition from the wholesale slaughter of a large proportion of the stock. Because of slow maturity and, by modern standards, the low fertility of all unimproved animals such a regime, allied with losses from disease, would quickly have reduced the flocks and herds to vanishing point.

ACKNOWLEDGEMENTS

The identity of the house mouse remains was confirmed by Dr G.B. Corbet and the fish identified by A.Wheeler, both of the British Museum(Natural History); the identifications of and the comments on the bird bones were provided by D. Bramwell who enlisted the help of G.S.Cowles British Museum(Natural History) for confirmation of the hen harrier. I am indebted to Professor Peter and Dr. Juliet Jewell for their examination and recording <u>in situ</u> if the cow skeleton in Feature 61. and to J.A.Chamberlin for preparing the drawing from their original sketch.

REFERENCES

Chaplin,R.E.,1971."The Study of Animal Bones from Archaeological Sites." Seminar Press, London & New York.

Clason,A.T.,1967." Animal and Man in Holland's Past". p.104. J.B.Walters, Groningen.

Corbet,G.B.1964. " The Identification of British Mammals". Trustees of the British Museum(Natural History).

Cranstone, B.A.L.,1969 in Ucko,P.J. and Dimbleby,G.W.(Eds) " The Domestica tion ~~of Plants and Animals~~ and Exploitation of Plants and Animals. Animal Husbandry: The Evidence fron Ethnography."pp247-263 Gerald Duckworth, London.

Cunnington,M.E. 1924."An Early Iron Age inhabited site at All Cannings Cross Farm, Wilts." Devizes

Epstein,H.1969. " The Domestic Animals of China" Commonwealth Agricultural Bureaux. Farnham. Surrey.

Fock,J.,1966. "Metrische Untersuchungen an Metapodien einiger europäischen Rinderrassen. Diss. Munich.

~~Franks,~~

Harcourt,R.A.,1971 in Wainwright, G.J. and Longworth,I.H. Durrington
Walls, 1966-1968. Rep.Res.Comm.Soc.Antiq.London No XXIX.
1974. Prehistoric and Early Domestic Dogs in Britain.

Higham,C. 1967. Stock Rearing as a Cultural Factor in Prehistoric Europe.
Proc.Prehist.Soc.XXXIII.84-107

.... and Message,M.1969. in Brothwell,D.R.and Higgs,E.S.(Eds)
" Science in Archaeology", An Assessment of a Prehistoric Technique
of Bovine Husbandry. 2nd Edition. Thames and Hudson.

Jackson,J.W., in Clay,R.C.C. 1925-1927. An Inhabited Site of La Tene I
Date on Swallowcliffe Down. Wilts. Wilts.Arch.and.Nat,Hist.Mag.
43.90.

Kiesewalter,L.1888 cited by Muller,H.H. 1955 Jahresschrift fur Mittel-
deutsche Vorgeschichte.39.240. (Bestimmung der Hohein Widerrist
bei Pferden)

Miller,W.C.and Robertson,E.D.S. 1952. " Practical Animal Husbandry.
6th Edn. Oliverand Boyd, London.

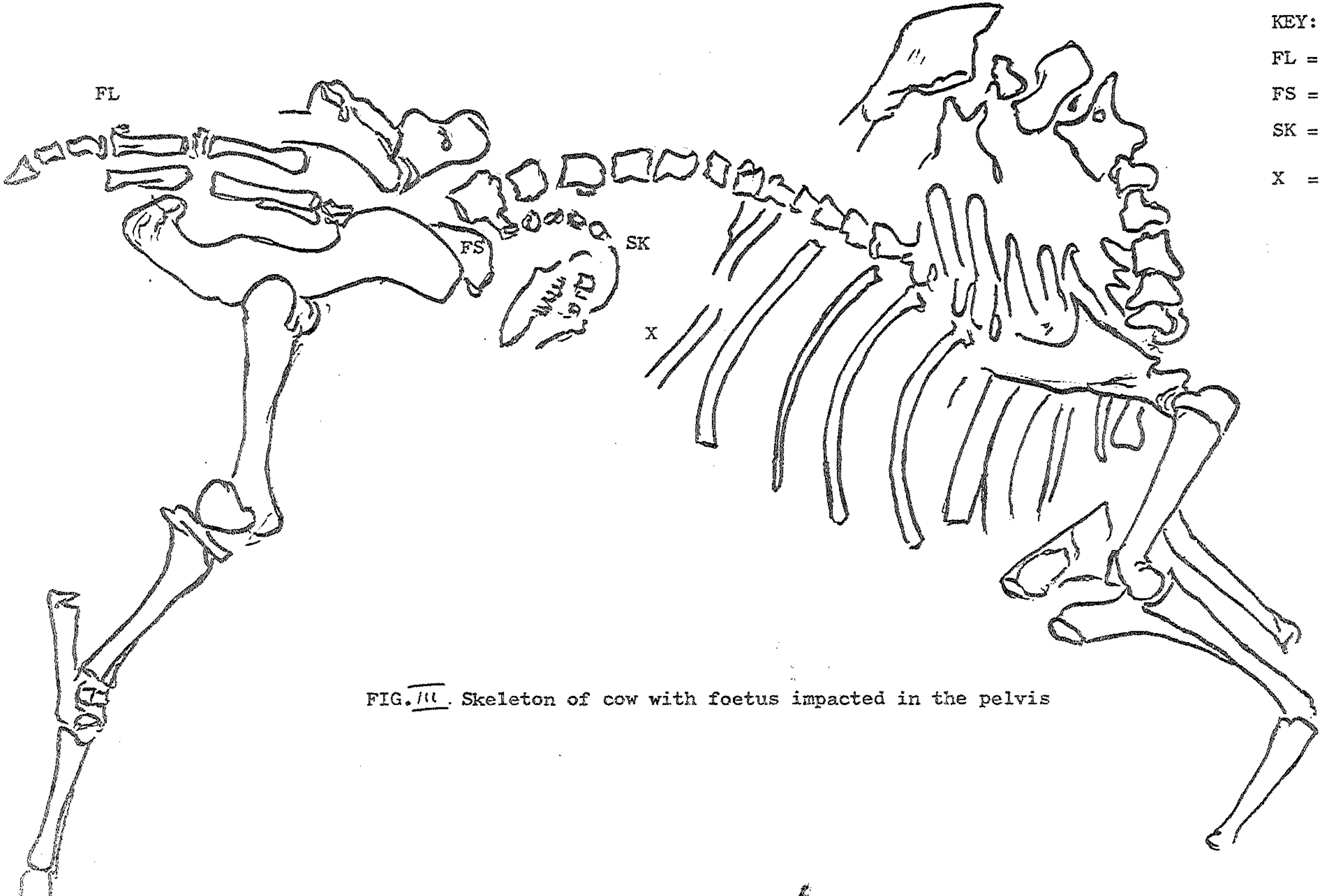
Perkind,D.and Daly,Patricia.,1968. A Hunters' Village in Neolithic
Turkey. Scient.Amer.219.5.96.

Piggott,S.1965. "Ancient Europe".p.236. Edin.Univ.Press.

Silver,I.A.,1969. The Ageing of Domestic Animals in Brothwell,D.R. and
Higgs,E.S.(Eds)."Science in Archaeology". 2nd Edn.p.283-302.
Thames and Hudson.London.

Tsalkin,V.I. 1961. cited by Ryder,M.L. 1969"Animal Bones in Archaeology"
p.49. Blackwell Scientific Publications. Oxford and Edinburgh.

White,K.D. 1970 " Roman Farming" . Thames and Hudson. London.



KEY:

FL = Forelimbs of foetus

FS = Foetal scapula

SK = Skull

X = Position of hindlimbs and pelvis of foetus

FIG. 111. Skeleton of cow with foetus impacted in the pelvis

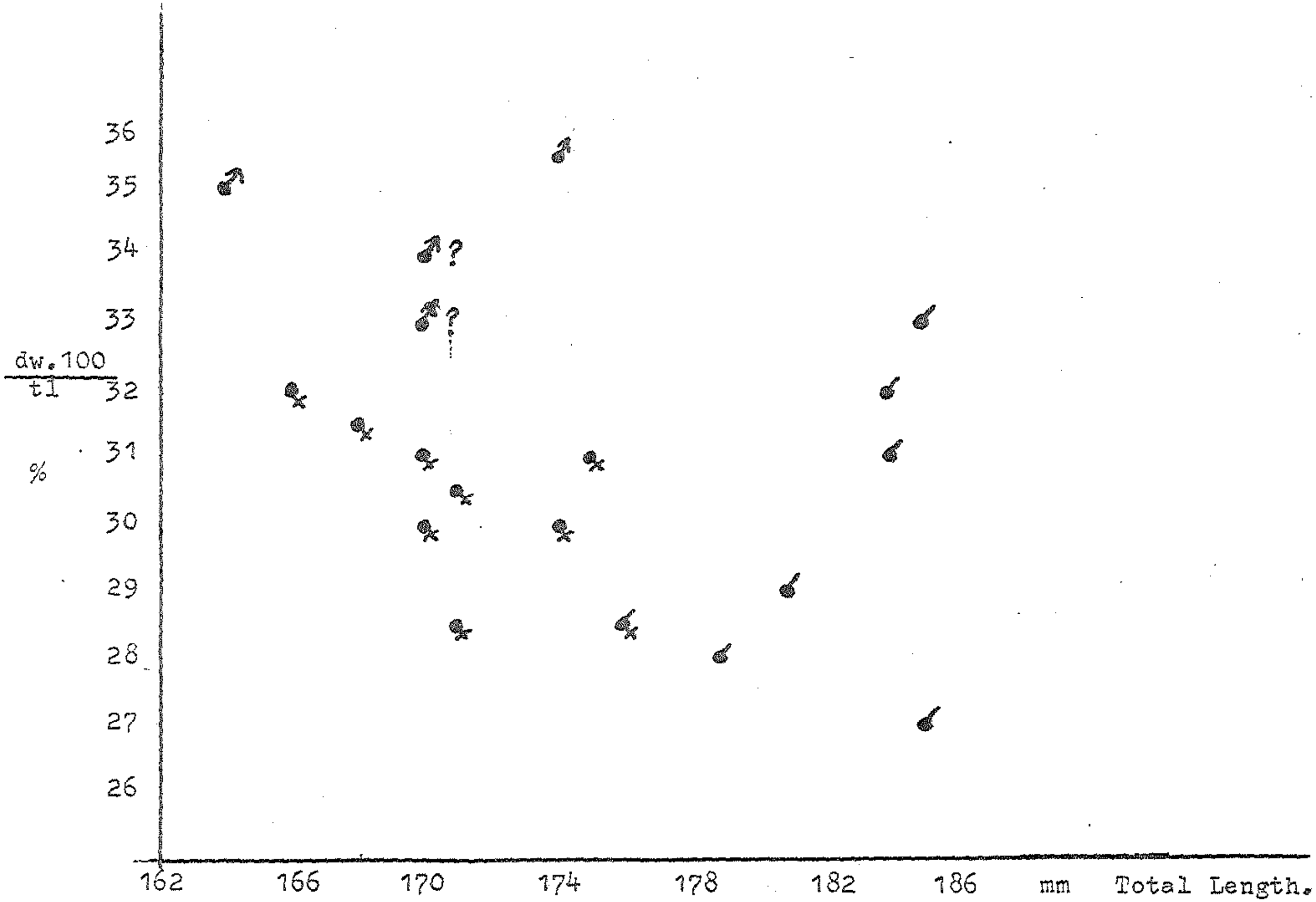


Fig. II. Scatter Diagram of Bovine Metacarpals.

= Cow; =Steer; = Cow or Steer; =Bull.

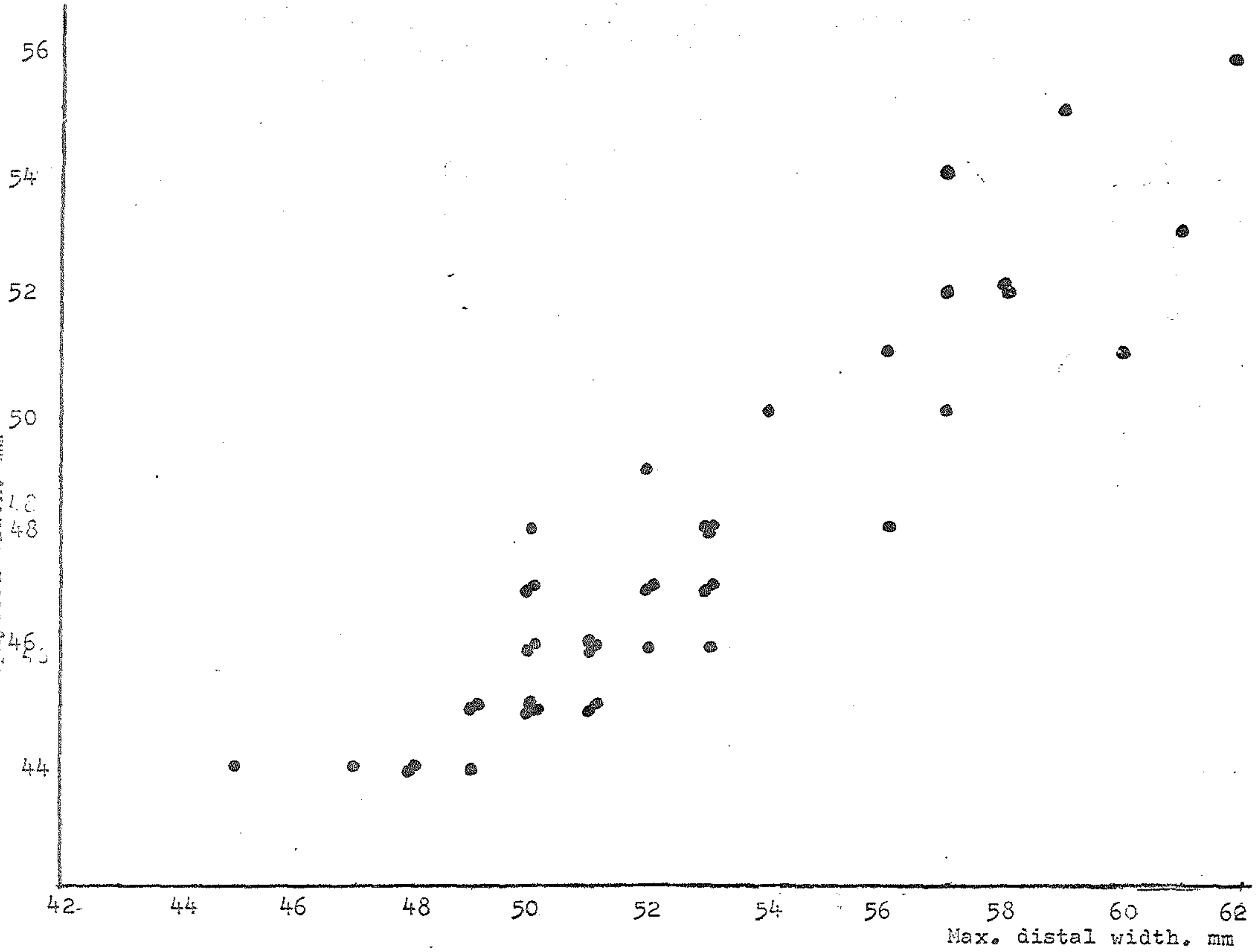


Fig. I. Scatter Diagram of Bovine Metacarpals.

1728

(for file)
Copy to M Spratling 16/9/74

ANCIENT MONUMENTS LABORATORY

MATERIAL WOOD

SITE: GUSSAGE ALL SAINTS (DATE:

SHEET: 1

AM No	X-Ray No	Photo No	Description and Report	Ref No
			Wood preserved by contact with iron.	
726897			Probably ash (Fraxinus excelsior).	373
726241			Possibly ash.	316

Carole Keepax